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to these points. The effect probably would be concentrated on the surfaces of maximum strain and shear.

The results of this enquiry may be of fundamental significance in theories of the origin of oil. The writer will appreciate any information thereon.

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THE CAUSES AND PREVENTION OF AFTER CORROSION ON THE BORES OF FIREARMS¹

THE report of an experimental study, containing also a careful review of the scientific, patent, and trade literature and a compilation of empirical experiences which have variously attributed after-corrosion on oiled bores as due to powder acids, diffusing gases, primer acids, metal fouling, and chlorides.

Humidity relations, chemical examination of the corrosive residue, special ammunition, and a study of many so-called "gun oils" and "nitrosolvents" showed:

The infantry service cartridge leaves no nitrocellulose or acid residue. The after-corrosion is caused by (1) the deposition of a water soluble salt or salts capable of giving corrosive solutions, (2) the presence of a humidity high enough to form a liquid film, and (3) the presence of oxygen. In the service ammunition, the decomposition of the chlorate of the primer furnishes the only water soluble salt. Pits and tool wounds retain this, so that it can not be removed mechanically. It may be dissolved by water. Corrosion may also be prevented by stoppering the bore or by altering the composition of the primer. A number of the non-aqueous compositions sometimes recommended for cleaning rifles are of no value. Their virtues apparently rest on tests conducted at humidities so low that no corrosion could occur.

The paper is illustrated with photographs and photomicrographs. It presents a simple test for differentiating between worthless and useful "nitrosolvents" and also discusses the

corrosive effects of black powder and low pressure nitrocellulose powders.

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SCIENTIFIC BOOKS

An Introduction to Entomology. By JOHN HENRY COMSTOCK, Professor of Entomology and General Invertebrate Zoology, Emeritus, in Cornell University. Ithaca, N. Y., Comstock Publishing Company. 1920, xviii + 220 pages, 220 figs.

The dean of American entomologists has just issued the first part of a second edition, entirely rewritten, of his long-known text-book called "An Introduction to Entomology." It covers the structure and metamorphosis of insects, and it covers these subjects in such complete and thoroughgoing way and, at the same time, in such compact manner, as to make the book by all odds the very best of extant texts to put into the hands of entomological and zoological students. It will be indispensable for beginning students; it will be very useful for advanced ones.

Such large compendiums as Berlese's (as yet only available in the original Italian), and Sharp's (in the English "Cambridge Natural History") and Packard's "Text-book of Entomology," are all of a character which limits their use in the laboratory to that of reference books; they are too extended and expensive, to say nothing of their less adapted organization and general make-up, to permit their use as actual individual laboratory handbooks. Comstock's book fills exactly the long-felt need. It contains all the knowledge up to the very present, carefully analyzed, sifted, and a great part of it actually contributed or tested by Comstock and his students, that the general student of insect structure and post-embryonic development needs to know. And it is all packed away, in perfect arrangement, with elaborate analytical contents, sufficient index and bibliography and carefully chosen illustrations, in about two

¹ Published by permission of the director of the U. S. Bureau of Mines.

² Chemist, Pittsburgh Experiment Station, Bureau of Mines.